

Small Minnesota town ready to be big Energy City

Most towns with a population of less than 25,000 would be considered progressive to have one or two renewable energy or energy efficiency projects. For Elk River, Minnesota's Energy City, 16 projects are only the beginning.

In 1997, the Minnesota Environmental Initiative chose Elk River from more than 30 applicants to demonstrate cutting edge renewable energy and energy efficiency technologies. "We saw it as a way to position the town to attract forward-looking, energy-related businesses and factories," said Vance Zehringer, Elk River Municipal Utilities key accounts and special projects manager. "It was also the right thing to do for the environment and quality of life here."

Diversified energy supply

At the time of its Energy City designation, the central Minnesota town was already home to a successful 40-MW, refuse-derived fuel powerplant, Elk River Station.

Elk River's own 2.4-MW, landfill-gas-to-energy powerplant, commissioned in 2002, currently supplies 11 percent of Elk River's energy needs. The addition of another 800-kW unit to the facility will boost that figure to 15 percent.

A privately-owned 660-kW wind generator is another source of renewable energy. "While Xcel buys the power from the generator owner, I doubt the electrons go much further than Elk River," Zehringer observed.

The municipal utility also recommissioned a 10-MW diesel peaking powerplant. "The city gets a better rate on electricity by having its own peak generation," explained Zehringer.

Great River Energy, the municipal utility's power supplier, owns several large powerplants including Elk River Station. The wholesale cooperative also buys the excess generation from Haubenschild Farms, another Energy City demonstration. The 800-cow dairy farm features an anaerobic digester and methane-fired generator that produce all the electric energy needed by the entire farm plus 75 additional homes.



LEED-certified Westwood Elementary School is one of several public buildings that Elk River, Minn., designed for energy savings as part of its ongoing Energy City demonstration program. (Photo courtesy of Elk River, Minn.)

Building efficiency

Renewable energy is only one facet of Energy City, however. Promoting infrastructure that uses energy more efficiently is just as important, said Zehringer. "Elk River was the first city in Minnesota to convert all its traffic lights to light emitting diode units," he pointed out. "LEDs are more expensive than conventional bulbs, but they reduce energy consumption by 90 percent and they last 10 times longer, so we save maintenance costs. The conversion paid for itself in less than two years."

Public buildings are being retrofitted or designed for greater efficiency, too. Geothermal heat pumps provide economical heating and cooling for many buildings including Elk River Public Safety Building and Otsego Elementary School.

The city is aiming for a platinum LEED certification for its new library.

See ENERGY CITY, page 2

What's inside

Solar Olympics.....	3
Vending machines	5
Arizona solar plant.....	6
Volga load control.....	8
Corn Belt test burn.....	9
Utah building efficiency.....	10
Green national parks.....	11
Governors' report	13
DOE honors Western	14

Energy City *from page 1*

Two schools, Zimmerman Elementary and Rogers High School, are LEED certified, and a third school is up for a gold certification, Zehringer said proudly. “We plan to host the National Energy Issues Conference at the new Twin Lakes Elementary next April.”

Energy City partnered with the Suburban Northwest Builders Association to build the highly efficient Energy House demonstration homes.

Energy House I featured electric technology, while efficient use of natural gas was highlighted in Energy House II. Energy House III, which featured T-Mass basement walls and structural insulated panel walls and roof, returned to its electric roots with a geothermal heat pump system, automated controls and efficient lighting and appliances. “Natural gas prices aren’t expected to decrease whereas electric rates are much more stable and predictable,” explained Zehringer.

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Indoor air quality was also highlighted in the Energy House III. Construction practices used in the house’s foundation and walls totally eliminate mold potential. That, plus a whole-house air exchanger, will keep it mold-free. The builder used low-volatile organic compound products in flooring, paint, furniture, decking—wherever possible—to help optimize air quality.

Economic growth

Economic development is as much a part of sustainable community needs as efficient buildings and clean energy. The Energy City model merges Elk River’s resources with those of the energy efficiency and renewable energy industry to show that what is good for the environment can also be good for business.

Industry partnership has been a central part of the Energy City program. The cooperation of Sherburne County, Great River Energy and landfill owner Waste Management, Inc., was instrumental to the success of the landfill gas powerplant.

Johnston Controls entered into a 15-year, \$3 million agreement with Elk River School District to do an energy efficient retrofit on 11 of 13 school buildings. The district anticipates \$206,338 in annual energy savings and \$116,353 in annual operational savings.

Not content to simply partner with industry leaders, Energy City lends a hand to up-and-coming companies with the Elk River Business Incubator program. The incubator provides low-cost space and support to small, higher-technology companies

whose success could diversify the city’s economic base. Companies such as Solar Attic solar pool heater manufacturer, Cymbet Corporation rechargeable battery maker and Bixby Energy Systems biomass technology company launched from the incubator.

New business

Bixby eventually relocated to Rogers, Minn., Zehringer noted, but Cymbet graduated from the incubator and kept its plant—and its jobs—in Elk River. More jobs will come with the completion of Target Corp.’s 159,400-square-foot data center next year. The facility will link the department store’s distribution centers across the country.

The municipal utility is working with the retailer to reduce the building’s demand and energy. The retailer will be eligible for rebates for efficiency measures for lighting, HVAC, motors and variable frequency drives.

The rebates are not an Energy City project, but something that Zehringer set up years ago when he worked for United Power Association, which later became Great River. “We have one of the best arrays of energy efficiency programs in the state, for a utility of our size,” he noted proudly.

Make that for a utility of any size. Elk River’s greatest accomplishment as Minnesota’s Energy City may be showing that there are many ways to protect the environment and that sustainability has a big future even in small towns. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2006/august/aug061.html

Solar Schoolhouse prepares students for a renewable future

Ask Customer Service and Programs Manager Rob Lechner why City of Lodi Electric Utility sponsors the Solar Schoolhouse Olympics at schools in its service territory and he makes it clear. “We want to train young people to look at renewable energy as the hope for the future.”

For the third year in a row, Lodi and Imperial Irrigation District teamed with the Rachus Institute to challenge students to demonstrate their knowledge of photovoltaic technology. More than 250 students from six high schools and five middle schools participated in the IID event. Lodi opened its Olympics to K-12 students and had more than 300 participants. “Each year, we get more participants,” said IID Demand Side Manager Phil Falkenstein.

The Solar Schoolhouse Olympics is a component of Rachus’s Solar Schoolhouse educational program. “Rachus developed Solar Schoolhouse to get renewable energy issues into the science curriculum in public schools,” explained Executive Director Tor Allen. “We launched the Olympics two years later to extend solar power beyond the science classroom.”

Solar Olympics

The plan was a success from the start. “When I sent out the guidelines for the first Olympics, English teachers, social studies teachers and art teachers responded, as well as science teachers,” said



A group of Lodi teachers show off their solar creations at a April 2003 workshop. (Photo by Rachus Institute)

Allen. The Solar Olympics give students the chance to put what they learned from the curriculum into practice. Using solar panels and materials contributed by Rachus and sponsors, participants build model solar homes, solar fountains and PV-powered cars and bake cookies in solar ovens.

“One art class assigns the Solar Olympics art competition as its final assignment, so we get a big selection of student art pieces to choose from for the T-shirts,” Allen said.

The solar “racecars” are very popular with Lodi’s Olympians, said Lechner. “It’s really impressive to see how much their models have advanced in just three years,” he noted.

Lechner’s son’s sixth-grade science class was among the first to build a solar-powered car to compete. The utility awards \$1,000 mini-grants to teachers to help fund project construction.

Falkenstein agreed that solar car races were a big hit at IID’s event,

“but the students in the other events might argue that.”

“The kids make some incredible model homes,” added Allen. “One welding class turned their solar panel, sheet metal and fountain plumbing into a 12-foot sculptural piece.

The students learn Solar Olympic skills and discover a broad spectrum of energy issues through Solar Schoolhouse’s curriculum of hands-on projects and Web-based learning. Rachus, a nonprofit research institute that focuses on resource efficiency, developed the curriculum to promote what Allen calls “energy literacy.”

Teachers learn

Rachus piloted the first Solar Schoolhouse curriculum in Alameda County, Calif., in 2001. Since then, teachers from 28 schools, mostly in California, have attended the summer training sessions.

See SCHOOLHOUSE, page 4

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug062.html

Schoolhouse

from page 3

The week-long workshop gives teachers a crash course in renewable energy and introduces them to the science behind solar technology as well as practical applications. They learn how to build measurement instruments, collect solar data, design classroom experiments and build working solar-powered projects. The first workshops ran for four days, Allen recalled. “When we asked how Rahu could improve the training, teachers said, ‘Add another day.’”

In addition to the intensive summer school, Solar Schoolhouse conducts one-day workshops throughout the year. The shorter sessions are designed to help teachers incorporate hands-on lessons into the classroom. Schools can also get educational kits and special projects from Solar Schoolhouse.

Flexible program

The menu of products and programs available through Solar Schoolhouse helps utilities and schools create educational partnerships tailored to different needs and budgets. Lodi and IID support their extensive programs with funding from California’s public benefits charges, established in the state’s 1996 electricity restructuring bill. Southern California Public Power Association is considering a package deal that will allow members with tight budgets to

offer Solar Schoolhouse training to teachers in their service areas.

Sacramento Municipal Utility District came up with a different strategy to fund its first teacher training last year. The utility didn’t have the budget for a partnership with Rahu, but it did have used PV panels. “We worked out an old-fashioned barter,” said Allen.

Brawley Union High School’s regional occupational program builds and sells houses and reinvests the proceeds in the program. IID approached the school about adding solar power to some of the houses. “Rahu trained the teachers and the students as part of the deal,” said Falkenstein. “It was true recycling.”

Three Brawley ROP students went on to attend Solar Energy International training in Carbondale, Colo. “SEI will help them find jobs in the solar industry,” Falkenstein said.

More than public relations

If Solar Schoolhouse is creating a pool of future solar contractors, it is also creating a growing demand for their services. “Each time we hold the event, we get calls from parents who want to talk to contractors,” said Lechner.

Parents’ interest, he added, follows that of their children—“Call it the ‘trickle up effect,’” said Lechner. “The Solar Olympics has helped Lodi reach older consumers.”

Getting kids to think about energy in general is an important step toward meeting renewable

energy and conservation goals, noted Falkenstein.

Allen, who is part of the California Photovoltaic Utility Managers working group, has noticed the change in the industry view of green programs. “It used to be a good public relations move,” he said. “More and more, though, renewable energy and energy efficiency are seen as key strategies for controlling costs now and securing our future,” he said.

Lechner agreed, pointing out that every kilowatt saved, or produced by a solar panel, replaces a kilowatt of supplemental power his utility would otherwise have to buy. “We save money and that helps to keep our rates stable.”

Rising energy prices, increasing demand and renewable portfolio standards are encouraging more utilities to embrace the technology. Rahu has been getting more requests and queries from outside California and Allen is packaging Solar Schoolhouse materials that are not specific to any state. “We’re exploring ways to work with utilities and educators all over the country,” he said.

That’s good news to utilities discovering that educated consumers are one of their most valuable renewable resources. ⚡

Vending machine efficiency measures serve up energy savings

Like its residential cousin, the refrigerator, the vending machine has the potential to be a sneaky Energy Hog or—for energy-wise businesses and agencies—the source of significant electricity savings.

According to Energy Star, there are around 3.4 million refrigerated beverage vending machines installed across the United States. Those machines operate 24 hours a day, seven days a week, each consuming between 2,500 to 4,400 kWh per year, or a total of more than 15 billion kWh annually.

Efficient Energy Star-rated models are available, so getting control of the load could be as simple as upgrading equipment—if facilities owned the vending machines. However, most machines are leased from the beverage manufacturer or a management company on multiple year contracts.

When a contract comes up for renewal, a business can request Energy Star machines in its request for proposals. Facilities in the middle of long-term contracts may be able to work with vending machine owners to upgrade their fleets. Some Western customers found other ways to reduce their vending machine loads.

Control technology

The Colorado Governor's Office of Energy Management and Conservation installed the VendingMiser energy control device on 200 cold beverage machines in state buildings in 2004.

The VendingMiser uses an infrared sensor that powers down a cold beverage machine when occupancy

levels indicate no activity. The vending machine automatically powers up at appropriate intervals to keep the drinks cold, independent of occupancy.

The project started when the Colorado Department of Public Health and Environment was looking for ways to reduce electricity bills in its leased office space. Since the landlord controlled investment in building improvements, the facility manager concentrated on appliances and systems that were CDPHE property. "It turned out that vending machines could be controlled, too," said OEMC Program Manager Susan Castellon.

Following successful installation of VendingMisers at the CDPHE laboratory building, the CDPHE Sustainability Program conducted a test on nine beverage machines fitted with devices. These test machines used an average of 41 percent less electricity, for an approximate annual savings of \$78 per machine.

"It was the logical conclusion," Castellon said. "If VendingMiser could save money for the Health Department, it could do it for others."

The Pollution Prevention Advisory Board, a governor-appointed panel that advises the CDPHE Sustainability Program, gave the OEMC a \$30,000 grant to install 200 units in state agency buildings. The office worked with the Department of Human Services Business Enterprise Program for the Blind to pick the facilities that would benefit the most from VendingMisers.

OEMC provided education and installation information on VendingMiser

to building managers to encourage their acceptance of the device. Health and Human Services and Personnel Administration are among the departments that received VendingMiser retrofits. Castellon estimates that the program saves Colorado taxpayers \$15,600 each year.

University reconsiders

Not all state agencies wanted to participate in the program, added Castellon. "Colorado State University was getting a coincident peak rate from its utility [Fort Collins, Colo., Utilities], so the savings weren't that significant," she recalled.

Because an occupancy sensor operates the unit, the vending machine will only cycle off when occupancy is low, which is most likely during off-peak hours. "We weren't saving anything in demand charges," said CSU Utility Engineer Carol Dollard. "Shaving a few cents from off-peak prices couldn't justify the investment."

Then, in early 2006, Fort Collins Utilities introduced a new rebate on kilowatt savings. That caused CSU to take another look at VendingMiser. "The message is, 'incentives work,'" acknowledged Dollard.

It also helped that per-unit price for 154 devices was significantly less than what the university paid for the three VendingMisers it tested three years earlier. "Those factors combined to make the retrofit feasible," Dollard said.

Data from plug monitors on the original vending machines reveal another factor that affects

See VENDING MACHINE, page 7

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug063.html

Arizona solar plant revives neglected technology—with a twist

Anyone who wants to see the solar comeback story of the year need only look in the mirror—one of the mirrors covering 100,000 square feet of desert between Phoenix and Tucson.

On Earth Day, Arizona Public Service Company dedicated the 1-MW Saguaro Solar Trough Generating Station, the first such plant to be built in the United States since 1990. “It’s also the only powerplant we know of in the world that marries concentrating solar technology with a process usually associated with geothermal powerplants,” said APS Technology Development Manager Peter Johnston.

Instead of generating power through photovoltaics, concentrating solar technology uses mirrors to heat mineral oil. The hot oil then boils water, producing steam that drives a turbine. At APS’s facility, six rows of 15-foot-tall, trough-shaped mirrors concentrate sunlight to heat mineral oil, but the oil is used to boil an organic liquid instead of water.

The process, called the Organic Rankine Cycle, generates more power at lower temperatures than a steam-driven system and is common in geothermal and biomass applications. “The Saguaro Station generates electricity with the same technology,” Johnston explained, “except that the heat comes from the sun instead of the earth.”

Innovation needed

The investor-owned utility is no stranger to solar power, or to innovation. Starting with its first large-

scale PV system in 1997, APS has developed more than 5 MW of solar power. Projects include installations at Prescott and Tempe that track the sun to extend generation hours. A highly concentrated photovoltaic plant at the Glendale Airport employs special lenses to concentrate the sun’s rays 250 times onto each solar cell.

The state renewable portfolio standard approved by the Arizona Corporation Commission in 2002 was the impetus behind the utility’s latest project. It required APS to generate 1.1 percent of its energy through renewable sources — 60 percent of that portion with solar — by 2007. Johnston said, “We realized that we needed something on a large scale if we were going to meet the goals.”

The utility issued a challenge to developers to come up with a solar system that could compete cost-wise with photovoltaics. Parabolic trough technology seemed to offer an answer, but only at a minimum size of 50 MW. “We had something along the lines of one MW in mind,” said Johnston. “That’s when we became interested in combining the technology with the Organic Rankine Cycle turbine.”

Hank Price, the parabolic trough project manager at the National Renewable Energy Laboratory, observed that the ORC could be easily adapted for smaller solar projects. “It opens up a whole new size range that is still utility scale.”

NREL provided technical expertise to APS and Solargenix Energy and Ormat International, the development team that won the contract to build the facility. Solargenix provided the



At APS’s Saguaro Generating Station, six rows of 15-foot-high mirrors generate electricity by heating oil to drive steam turbines. (Photo by Arizona Public Service Company)

parabolic troughs and integrated the system with the power conversion unit Ormat designed and installed.

Storage a possibility

APS and NREL may collaborate on an addition to the solar trough plant that will build on the ORC innovation.

Because parabolic technology uses heated fluid, it offers the potential for thermal energy storage, which could increase solar power’s dispatchability. Adding a TES system to the powerplant, as NREL proposes, could allow APS to tap the powerplant hours after the sun goes down or on cloudy days.

Peak solar generation occurs in the middle of the day, while APS’s load peaks around 6 PM on summer days. “When people get home from work, they turn up the air conditioning,” said Johnston. “If we could pull off that time shift, it would be a huge step toward integrating solar power into our mix.”

TES would do much to increase the already-growing acceptance of concentrating solar technology.

See SOLAR PLANT, page 7

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug064.html

Solar plant

from page 6

According to Price, the Saguaro Station has opened the door for other parabolic powerplants. A 64-MW project is under construction in Nevada and the California Public Utilities Commission approved a contract for a 500-MW facility last fall, with expansion options up to 850 MW.

The technology is not suited to residential applications or to northern climates that don't have high, direct normal solar resources. For southwestern states, however, the solar trough could offer a cost-effective alternative to photovoltaics at utility scale. California is home to all nine of the nation's parabolic powerplants.

Opportunity, interest

Rising energy prices, incentives and

the RPS are playing a key role in the return of concentrated solar systems.

The RPS was the driver for this project, however, since it was completed before the 30-percent investment tax incentive in the 2005 Energy Bill went into effect. "The ITC won't be available to utilities like APS," Price added, "but the incentive will be necessary to make larger CSP plants competitive with conventional powerplants. The incentives need to be longer, particularly for this technology."

Installing solar panels is relatively quick and easy compared to building a parabolic facility, he explained. "Larger plants take around three years to site and build, so the only projects that benefit from incentives are the ones that are already in the pipeline."

APS customers fund all APS renewable energy projects through

an environmental portfolio surcharge the Corporation Commission implemented four years ago. The Commission's strong commitment to renewable energy—it recently gave preliminary approval to boost the RPS to 15 percent renewable resources by 2025—is improving the picture for third-party developers, too.

The solar industry may have the public to thank for that administrative boost. A recent poll showed that 75 percent of Arizona customers are willing to pay a little more to ensure energy independence.

The public response to the Saguaro Station indicates strong support for renewable energy. More than 400 people showed up for the plant dedication. "We get a lot of industry calls, and people love to have their picture taken here," Johnston said. "It's a very photogenic plant." ⚡

Vending machine

from page 5

the VendingMiser's performance. The two machines located in busy hallways use only about 25 percent less energy. A third in an out-of-the-way break room saves the manufacturer's promised 40 percent. "You get the most benefit from machines in areas with low or sporadic occupancy," noted Dollard.

Different strategy

Predictable building occupancy helps Poudre School District control its vending machine loads without adding an energy control device.

PSD Energy Manager Stu Reeve clustered vending machines on school building automation systems, and took advantage of Fort Collins Utilities' time-of-use rates. While

school is in session, vending machines run during the day and cycle off around 5 or 6 p.m. They come back on between 2 and 3 a.m. to make sure the drinks are cold for that first soda of the morning.

The savings from that strategy are better than an energy control device, Dollard observed, but it wouldn't work at a university. "It's not unusual for students in dorms to be using vending machines at 3 a.m."

PSD tested the VendingMiser, but, like CSU, didn't see the expected savings. "Our rates are about 6 cents per kilowatthour, even with the wind power," said Reeve, referring to the utility's wind power program. "If a facility is paying eight to 10 cents, then the savings might be closer to the manufacturer's estimate."

Also, vandalism can be an issue if the VendingMiser is not placed in a

protected area. "The unit sits next to the machine and it can be a tempting target," said Reeve.

Energy Star-rated machines remove the temptation by building the technology into the unit. PSD recently re-bid its vending machine contract, and made efficient machines one of the criteria.

Businesses can make their conventional vending machines more efficient, Castellon suggested, by delamping them—removing the light, where appropriate. CDPHE testing on machines that served only staff, and not the public, showed that delamping could save an additional 23 percent of energy use without affecting sales. "That's nearly as good as an energy saving device, without a purchase price," she said. ⚡

Volga, S.D., takes control with new spin on load management

A cost-control strategy as effective as load management seems like it ought to be expensive and complicated, which may be why Electrical Distribution Superintendent Kevin Schultz sounds humble when explaining Volga, S.D., Utility's water heater load management program. "There's nothing fancy about the system. It uses off-the-shelf technology," he said.

Schultz's secret for getting greater load control while maintaining customer comfort and saving money and energy is a standard 30-amp relay, or rather, two relays. One unit remotely shuts down the customer's hot water heater during times of peak demand. The second relay controls the heater's bottom element separately.

"With a whole-heater system, people who use all their hot water are controlled the same as people who use a lot less," he said. "If we can shut off just the bottom element, the hot water recovers much faster."

Two relays

Volga Utility set out to update its 20-year-old, mandatory load management program in 2004. "Participation had become voluntary over the years as old heaters were taken out of service," said Schultz. "Our goal was to get a handle on our peak demand costs before they got really out of hand."

Schultz went first to Comverge, the company that had originally provided the hardware for the program, to see if more advanced equipment was available. Instead, he decided that adding a second relay—just like the one Volga used to control the entire heater—would give the utility more options to

manage load.

As load ramps up, Volga cycles off the bottom element. "That may be enough to control the peak," said Schultz. If not, the entire water heater can be shut down, "usually for a fairly short period of time," he said. "Once the peak subsides, we return to managing the bottom element alone. That's what allows quicker recovery."

The second relay added \$15 to the cost of updating the load management system and required the installer to hook up three wires instead of two. "We trained our electricians to make that modification and that was all there was to it," Schultz noted.

Software, water heater

Not quite all—two more components were needed to implement the system: a software package to operate it and water heaters to control. "Our software vendor was able to write a program to accommodate them," said Schultz.

Volga's water heater of choice was the high-efficiency Marathon electric water heater. The Marathon installation manual shows how to hook up the third wire for a utility-mandated timer or load management box. "And, it doesn't affect the warranty," noted Schultz.

He added that most water heater manufacturers allow utilities to control the bottom element alone. "Apparently, enough utilities are using this strategy that it is becoming standard," Schultz observed.

Customers get on board

Volga's program gives customers a monthly incentive for participating in load control, along with a great deal

on one of the most efficient hot water heaters around. Customers who want to replace an old hot water heater can get a discount on an 85-gallon Marathon fitted with dual relays from the municipal utility.

More than 80 customers have taken advantage of the offer since September 2004.

Any home with a 50-gallon or larger unit is eligible, including mobile homes and apartments with individual water heaters. The digital control unit that "pings" the relay is installed on the outside of the house making it easy to check for compliance.

Program fits city

Dual-relay water heater management has given the utility control over 90 percent of its incidental water heater load. Schultz admitted that the system benefited from demographic factors specific to Volga. The majority of the city's residents are employed by businesses in nearby Brookings, so they are mostly on the same working schedule.

The same off-the-shelf technology could be applied to other loads as well. Most Volga city buildings have dual fuel with electric heat, and dual relays have been installed in some facilities to stage heating. However, the utility has no plans at this time to expand load control beyond water heaters. A simple twist on a standard load management practice has given Volga Utility an organized, effective and enforceable program that frees up enough power without penalizing customers. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2006/august/aug065.html

Corn Belt test generates electricity with Iowa's homegrown fuel

To turn corn into an alternative to fossil fuel, you can process it into ethanol, or you can do what Corn Belt Power Cooperative did last winter and just toss the ear into a boiler.

More precisely, the Northern Iowa generation and transmission cooperative fed 470 bushels of shelled corn into its pulverized coal-fired Wisdom Unit 1 boiler on February 16. Burning a mix of 20 percent corn and 80 percent bituminous coal, the plant reached approximately 96 percent of its gross output level. "We plan to conduct a more extensive test soon," said Mike Thatcher, Corn Belt's vice president of generation.

The idea of the test burn came up at a Corn Belt directors' meeting. Discussions centered on the rising costs of buying and transporting coal and the increasing expense of sulfur dioxide allowances. Someone casually suggested that it would be cheaper to burn Iowa corn. Thatcher said, "When the price of corn goes down, the other expenses associated with burning coal make corn a cost-effective alternative."

Corn, after all, is grown in Corn Belt's service territory, by co-op members. The grain's sulfur content is lower than coal's, so emissions allowances would cost less.

Emissions, equipment

Cost was only one of the issues that had to be addressed. Corn Belt's air operating permit allows the plant to burn only coal, so the utility had to apply to the Iowa Department of Natural Resources for a variance. The agency issued the opinion that corn

was likely to give off fewer emissions than coal. The variance allowed Corn Belt to do a limited burn.

The type of equipment presented potential challenges, too. Thatcher had read about stoker-fired units burning corn, and knew that nearby Cedar Falls Utilities had tested several types of biomass in its 16-MW Streeter #6 stoker boiler. "Pulverized-coal units, however, have fewer options," said Thatcher.

Corn might not run through the grinder as easily as coal, and more corn would have to be pulverized because its heat content is lower than coal.

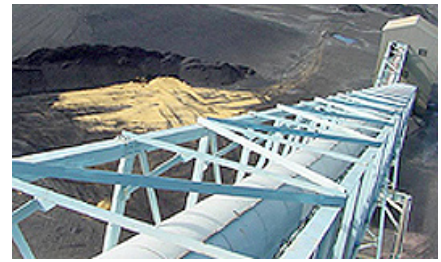
The grinder handled the corn with little difficulty, and the corn ash—stickier than coal ash—did not gum up the sides of the boiler. The test did reveal that corn requires specialized storage. "You can't store corn in the bunker for a long time like coal," observed Thatcher.

On the day of the test burn, Wisdom 1's sulfur dioxide emissions were lower than usual, while nitrogen oxide was slightly higher. "But that could be fixed with some equipment adjustments," added Thatcher.

Other fuels considered

In spite of the initial success of the test, Corn Belt won't be substituting shelled corn for coal in the Wisdom 1 boiler because corn is generally more expensive. However, the test burn opened up other fuel possibilities.

A Des Moines demolition company has offered Corn Belt waste left over from deconstructing houses. Thatcher said that construction waste might not be a problem for the coal mill, but



A test burn proved that shelled corn could be burned in Corn Belt's Wisdom Unit 1 coal-fired boiler. (Photo by Corn Belt Power Cooperative)

raised some concern about air quality. "The big challenge with refuse-derived fuel is making sure that it is free of potentially hazardous material," Thatcher explained.

Waste seed corn was another alternative fuel source that would otherwise wind up in a landfill. It is a local product like shelled corn, but less expensive because its germination date has expired, so it has no use to growers. The DNR is researching the environmental implications of the proposal, because the corn has been treated with fungicide.

Diversity is the key to success when substituting biomass for conventional fuels, confirmed Cedar Falls Project Manager David Rusley. "Our 16-MW unit would require the output of 50,000 acres if it was fired only with cornstalks," he said. "You have to have options."

Utilities like Cedar Falls and Corn Belt Power are exploring their options with test burns. In the process, they are learning that just as there are more energy resources than fossil fuels, there is more than one way to squeeze energy from corn. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2006/august/aug066.html

Utah sets high bar for state building efficiency

Saving energy can mean anything from changing a light bulb to changing the market, the goal of Utah's comprehensive state energy efficiency policy.

Governor Jon Huntsman's energy policy aims to increase the energy efficiency of the Utah economy by 20 percent by 2015. On April 26, the governor signed a ceremonial copy of House Bill 80, State Buildings Energy Efficiency Program, at the Spencer F. and Cleone P. Eccles Health Sciences Education Building on the University of Utah campus. The HSEB is the first state-funded facility to qualify for the U.S. Green Building Council's LEED certification.

The ceremony represented both the policy rollout and the joint effort that will implement the ambitious program. The state Division of Facilities and Construction Management teamed up with the Utah System of Higher Education to craft the High Performance Building Rating System at the heart of the policy. "DFCM builds all of the large facilities for USHE, so it was important to get their input," said State Energy Manager Curtis Clark.

Integrating building design

The rating system focuses specifically on energy use, but addresses many of the same issues as LEED. "Things like siting, indoor air quality and water savings all affect a building's energy performance," Clark noted.

The system sets minimum requirements for energy design of the building envelope, mechanical systems, lighting systems, service

water heating, power and other equipment. "The envelope and lighting systems have to exceed the State Building Code by 10 percent, and all other systems must comply with Code," said Clark.

The process for rating a new building begins in the design phase. DFCM conducts a study on the building plans, looking for ways to incorporate energy-saving technologies. With measures that included automated building controls, lighting program, white roof and highly efficient windows, the HSEB was still completed on budget and on time, said HSEB Director Wayne Peay.

The next step is a design and technology charrette, where project designers brainstorm ways to improve building performance. "The goal is to reach consensus," Clark said.

The design is reviewed following the charrette, and the building is constructed and commissioned. A third party verifies that the completed facility meets the state standard.

Other program components

The energy-efficiency policy does not neglect the more than 2,000 state buildings. "Recommissioning is low-hanging fruit—the savings potential is huge," Clark asserted.

He pointed to two research buildings on U of U campus as examples. "An investment of \$12,000 will save 1.3 million kW annually," said Clark. "That's the best use of taxpayer money."

Energy performance contracting offers another means to upgrade existing buildings. DFCM completed



The Eccles Health Sciences Education Building on the University of Utah campus is the state's first LEED-certified building. (Photo by University of Utah)

three pilot projects at Utah Valley State College, Draper State Prison and the Ogden Regional Office Building costing \$22 million. The facilities will repay the investment with the more than \$1 million in annual energy savings from the improvements.

Rocky Mountain Power is partnering with DFCM to reduce electricity use in state buildings. So far, about 30 buildings have signed energy-efficiency contracts with the utility to fund the capital cost of increasing energy efficiency.

One unique aspect of the policy is its promotion of energy-efficient products as well as buildings. It is similar to Energy Star, but it covers many more products, like chillers, transformers and lighting fixtures. Clark said, "Ultimately, it will help bring down the cost of high-efficiency products."

DFCM has compiled a database of qualifying products, and plans to make its research publicly available in the future.

See BUILDING EFFICIENCY, page 12

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug067.html

Sustainability initiative keeps national parks green

How times change. Diesel-powered ferries once carried prisoners to a fearsome maximum security prison on Alcatraz Island in San Francisco Bay. Now, visitors ride those ferries to the Rock, and soon, wind and sun will fuel the ferries.

The National Park Service recently awarded the 10-year ferry contract to a company that committed to build two hybrid-electric passenger vessels for Alcatraz tours. Hornblower Cruises & Events, who will operate the contract as Alcatraz Cruises, proposes to put the first vessel into service within two years and the second by five years.

Designed by the Australian company SolarSailor, the hybrid ferries will be fitted with a large, rigid wing covered in solar panels. Like a hybrid car, large batteries on board will store electricity from the array and from backup diesel generators. The vessels can also be plugged into shore power to regenerate the batteries. While loading and unloading passengers, the diesel engines will be turned off, and the vessel will run on electricity for zero emissions at the wharf.

Public-private partnerships

The Alcatraz ferry contract is only one strategy in “Green Energy Parks: Making the National Parks a Showcase for a Sustainable Energy Future.”

The joint program launched by the Department of Energy and Department of the Interior in 1999 promotes energy efficiency and renewable energy technologies in

national parks. In the program's first year, NPS and DOE invested more than \$1.5 million in 60 clean-energy projects focused on improving transportation, facilities and visitor education at parks across the country.

Americans expect their national parks to be “green,” observed Steve Butterworth, energy program coordinator for NPS's Pacific West Regional Office.

Concessionaires, like Hornblower and other private companies that run snack bars, transportation services and in-park lodgings, are major partners in increasing the sustainability of park operations. The 1998 concession reform law required concessionaires to make substantial sustainability efforts as part of their contracts with NPS, according to Golden Gate National Recreation Area Public Affairs Officer Rich Weideman. “That can mean anything from healthy snacks, to energy-efficient systems in lodgings to recycling,” he said.

Greener choices

It also means alternative-fuel vehicles, currently used for concessions and park operations in 29 parks. A fleet of biodiesel-powered ships serve Channel Islands National Park, and compressed natural gas vehicles have been used in the park since 1996.

The diesel passenger shuttle at Scotts Bluff National Monument runs on B-20, a 20-percent biodiesel/80-percent petroleum diesel blend. At Point Reyes National Seashore in Northern California, park staff drive around the park in electric vehicles.

Weideman pointed out that the



The National Park Service added a fourth grid-tied PV system to its maintenance building with money from green tag sales and incentives. (Photo by National Park Service)

Alcatraz ferries already have diesel engines that are 80 to 90 percent more efficient than average vessels.

Zion National Park in southwest Utah unveiled its own transit system in 2000. At the time, more than 2,000 cars and buses arrived at the park on any given day and competed for only 400 parking spaces. The park partnered with the near-by community of Springdale to use existing infrastructure, cutting down on the need for new construction. Now, visitors can take propane-powered shuttle buses from Springdale to a new state-of-the-art, energy-efficient Visitor Transit Center and then through Zion Canyon.

Facilities retrofitted

Zion's Visitor Transit Center is a showcase for energy-efficient, climate-sensitive building technology. Daylighting through clerestory windows, natural ventilation, evaporative cooling and a thermal storage wall that supplies radiant heat in colder months save the National Park Service around \$14,000 in annual energy costs.

See INITIATIVE, page 12

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug068.html

Initiative

from page 11

The parks in Butterworth's territory benefited from a \$1.5 million investment from Bonneville Power Administration. Parks that are served by utilities that get all their power from BPA receive money to upgrade lighting, thermostats and control systems in offices and private concession facilities. "Some of the savings from those measures are reinvested in energy efficiency," said Butterworth.

At Point Reyes, the park reused and restored historic structures with sustainable materials such as linoleum, waterless urinals and innovative paving materials. Solar panels provide power for the campgrounds and the Education Center.

Creative solutions

The use of renewable energy at park facilities may be Green Energy

Parks' biggest success. From a 2-kW array in the Everglades to a solar hot water system at Mount Rushmore to photovoltaic pumps in Yosemite, NPS generated more than 250,000 kilowatthours of renewable energy in the first six months of 2006 and is always on the lookout for more opportunities.

Development, however, must be balanced against the NPS's mission to preserve the beauty and integrity of America's parks and landmarks. On San Juan Island, Wash., building a solar array big enough to capture the Puget Sound sunlight would have meant encroaching on the park's cultural scenes. NPS asked Orcas Power & Light Cooperative, the park's utility, for a good site to net meter, recalled Butterworth. "We ended up building the system in its utility yard," he said. "There's no extra work load for park staff and no intrusion onto the historic landscape."

Whitman Mission National

Historic Site in Walla Walla, Wash., sells green tags from its 12-kW solar system to Pacific Power. Combined with incentives from Washington's new energy incentive program, the income financed the installation of additional panels that increased the project size by 25 percent—without using any additional funds.

Pacific Gas & Electric incentives helped Point Reyes get five PV systems with the money for four. "We reinvested part of the rebate in another system," said Butterworth. "You can make magic happen by being creative, while still being legal," he joked.

On a serious note, the energy program coordinator added, "Americans want their national parks to succeed, and sustainability is part of that success. We can be sustainable with the right combination of creativity, innovation and great partners." ⚡

Building efficiency

from page 10

Exposure, results

The potential energy and cost savings are driving acceptance of the new standards. "We have \$500 million in new construction and major renovation projects and \$65 million in capital improvements," said Clark. "So there is a tremendous opportunity to change our energy consumption."

The number of state buildings implementing performance contracts with Rocky Mountain Power has grown steadily since the governor signed the energy efficiency bill. Clark expects to see participation increase as the program documents savings.

The standards have even had an effect on private industry, according to Peay. Big-D Construction, the contractor for the HSEB, embraced the green building concept while working on the project. "They went

on to build their new headquarters to LEED specifications and it became Utah's first gold-level building," he recalled.

HB80, Utah's first step toward a more complete energy efficiency policy, is already starting to change how institutions think about energy. Once people change their minds, the light bulbs and the market will follow. ⚡

Western governors release clean energy report

On the opening day of the Western Governors' Association Annual Meeting, the governors endorsed a broad-based set of proposals to secure "Clean Energy, a Strong Economy and a Healthy Environment" for the West.

Ambitious goals

The report concluded that the technology and resources exist to meet or exceed the goals first laid out by WGA's Clean and Diversified Energy Initiative in 2004. The goals include developing an additional 30,000 megawatts of clean energy by 2015; increasing energy efficiency 20 percent by 2020; and ensuring secure, reliable transmission for the next 25 years.

More than 250 energy industry stakeholders worked for 18 months on task forces that contributed to the final report. Representatives from Western customers Basin Electric Power Cooperative, Kit Carson Electric Cooperative, Nebraska Public Power District and Tri-State Generation and Transmission Association served on the Clean and Diversified Energy Advisory Committee. Alan Edwards, who has since retired from Basin Electric, represented the challenge facing CDEAC—Basin is a coal-based utility with significant wind generation. "There is no one technology or resource that is the answer," he said.

Individual task forces studied energy efficiency, transmission, solar, wind, geothermal, biomass, clean

coal technologies and advanced natural gas technologies, and submitted reports to the CDEAC. Western's Power Marketing Advisor Bob Fullerton was a member of the wind task force. "This report demonstrates the regional governors' commitment to diverse generation sources," he said.

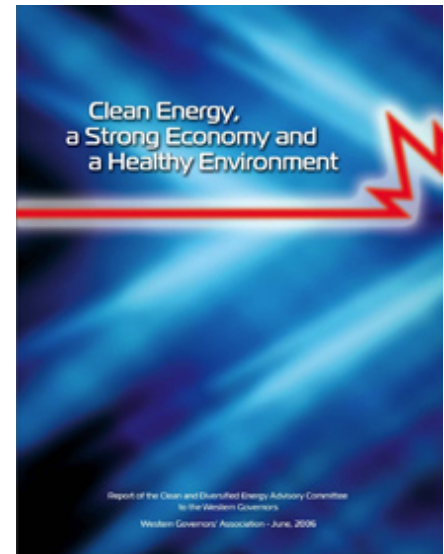
"The recommendations promise to build on the momentum of existing customer efforts to advance the role of renewable resources and energy efficiency," Fullerton added.

Broad spectrum covered

The WGA resolution stressed the need for cooperation across government and industry lines. The governors identified Federal policies and legislation that would advance CDEAC's goals, such as a long-term extension of the production tax credit. "In terms of renewable energy development, that is the most important recommendation," said Western Energy Services Manager Ron Horstman.

Raising the residential tax credit cap for renewable energy or distributed generation systems, as the governors advise, would help stimulate development in that sector, too.

Another recommendation supported tax credits for energy efficiency investments. The resolution also supported improvements in national appliance efficiency standards and encouraged funding for clean energy research and development. The governors called for strong collaboration



Clean Energy, a Strong Economy and a Healthy Environment is a roadmap for meeting the growing energy needs of the West. (Artwork by Western Governors' Association)

between state and Federal agencies on facility siting and infrastructure planning, as well.

Transmission critical

A number of recommendations addressed transmission, always an issue in the West, said Edwards. "Whatever the resource, you have to be able to get it to market," he observed. "I think the report did a good job of showing that transmission is a common sticking point to all types of development."

The governors urged smart transmission planning to make more efficient use of the existing electric transmission grid. The resolution advised incorporating energy efficiency, combined heat and power and other demand-side resources

See REPORT, page 15

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug069.html

DOE honors Western employee for wind energy leadership

Randy Manion doesn't take credit for the current wind energy boom, but he is pleased that the Department of Energy has recognized his efforts to help Western customers add renewable resources to their portfolios.

DOE's Wind Energy Program presented Manion with the 2005 Outstanding Program Leadership Award at its May 11 program review meeting in Golden, Colo. In a June 26 letter, DOE Wind and Hydropower Technologies Program Manager Stanley Calvert praised Manion for developing strong relationships with utilities, and educating those utilities on the value of wind power.

"It feels good to be recognized at any level; praise and compliments keep you working at 110 percent," said Western's Renewable Resources Program manager. "It's also a nice confirmation that I'm doing a good job for the Department."

Manion has done a good job for DOE—and for Western—since 1996, when Western established itself as the connection between DOE, renewable energy developers and our wholesale customers. "The goal of the program is to help customers interested in purchasing renewable resources to fully evaluate their options," explained Manion.

The program provides customers with technical assistance and marketing information on renewable resources. It also directly supports DOE's Strategic

Plan and the Wind Powering America Program, Manion added. "By helping utilities diversify their generation, the program indirectly supports Western's Integrated Resource Planning and Energy Planning and Management Program, too."

Partnerships extend reach

The growing interest in renewables over the last few years has kept Manion busy. In 2005, he represented the Wind Energy Program at more than 10 national and regional utility conferences and events.

"I enjoy representing Western and DOE's Wind Program at these events," he said. "It allows me the opportunity to meet and talk with hundreds of utility representatives each year—from energy services representatives to the CEOs of large public power and cooperative organizations, from rural cooperative board members to public power city council members. It's a rare opportunity to network with so many people in the utility industry."

Some of those exhibits were at events sponsored by the National Rural Electric Cooperative Association and the American Public Power Association. The partnerships Manion formed with the two national trade organizations has helped to extend Western's technical assistance resources to a wider audience.

Western and APPA's Demonstration of Energy-Efficient

Developments Program were part of a team that developed *An Implementation Guidebook to Expand the Role of Renewables in an Energy Supply Portfolio* in 2004.

Other members of the team included Gila Resources, DOE's GeoPowering the West Program, the Public Renewables Partnership and Wind Powering America. The step-by-step manual presented the strategies smaller, member-owned utilities used to increase their percentage of renewable energy.

Different media

The team followed up publication with a series of webcasts to show utilities how to use the guidebook. "It was a wonderful format for targeting potential users and getting them involved," recalled Manion.

The Western-APPA-NRECA partnership also produced a Wind Integration webcast series late last year. Around 120 utilities participated in three sessions covering wind development case studies, grid interconnection and impacts and wind energy economics. "Western believes that 'webinars' meet the needs of busy cooperative and public power utility representatives whose hectic schedules would otherwise keep them from attending a wind workshop or conference," said Manion. "The partnership plans to continue using the format to reach out to the industry."

*See EMPLOYEE HONORS
page 15*

Want to know more?
Visit www.wapa.gov/es/pubs/esb/2006/august/aug0610.html

Employee honors *from page 14*

Making accurate information on wind power available and accessible to customers is one of the most important functions of Western's Renewable Resource Program, in Manion's view. He has worked with industry groups to develop and distribute educational materials like the Wind Workshop in a Box CD, fact sheets like Wind Energy Myths and newsletters like the Green Power and Market Research News.

Manion also manages the PRP Web site, a one-stop location that collects and organizes the latest information on green power for electric co-ops, municipal utilities and tribal utility authorities. He recommends the Web site as a good starting point for utilities wanting to learn more about wind energy.

Western customers interested in wind power can also contact Randy Manion at 720-962-7423.



Calendar of events

Visit Western's regularly updated Energy Event Calendar for a complete list of seminars, workshops and conferences.

<http://www.wapa.gov/es/pubs/esb/2006/aug/aug06coe.htm>

Report

from page 13

into state transmission planning.

Expanding the grid to deliver remote generation will require strong cooperation among Federal and state agencies. "Last year's Energy Policy Act paved the way for greater collaboration," said Horstman.

States need to work with utilities to establish policies that will implement the CDEAC recommendations, added Doug Larson, executive director of the Western Interstate Energy Board. WIEB is the energy arm of WGA. "When load-serving entities adopt energy efficiency measures, they lose sales," he said. "Incentives need to be restructured to reward utilities for adopting the recommendations."

Moving forward

"Clean Energy, a Strong Economy and a Healthy Environment" confirms what the renewable energy industry has been saying about the West for years. It is not surprising that industry groups are eager to see its recommendations implemented. "The next steps are still evolving, but it will involve collaborations with organizations that share WGA's goals," Larson commented.

The National Wind Coordinating Council made its membership in that group clear by following up WGA's June meeting with a leadership forum in July. WGA co-sponsored "Implementing Transmission Recommendations in the West," which focused specifically on proposals made in the CDEAC transmission and wind task force reports. Western

Administrator Michael HacsKaylo was a panelist and Wyoming Governor Dave Freudenthal key noted the two-day forum.

"Recent studies show significant economic, hard dollar benefits to both supplier and buyer states from diversifying electric generation resources and increasing efficiency in the West," Freudenthal said. "This means we could lower costs for consumer states and increase revenues for producer states across the region."

"The NWCC can play an important role in facilitating agreements among the necessary actors," said Larson. "There's a strong feeling among the stakeholders and WGA that we want action to implement the CDEAC recommendations," he added.





Energy Shorts

USDA loan program

Low- and moderate-income families can look forward to more assistance from the U.S. Department of Agriculture when buying energy-efficient homes in rural areas.

The USDA recently introduced enhancements to its Rural Development Section 502 homeownership loan program called Home Energy Advantage. Loans are available to qualified families to purchase modest homes in rural areas. Under the new program, the qualifying ratios for home loans may be exceeded by up to two percentage points if an energy-efficient home is purchased.

All new homes that are built to meet the 2000 International Energy Conservation Code or a subsequent comparable code are considered energy efficient and eligible for the two percentage point increase. Existing homes that meet the same standard, or are being retrofitted to meet it, are also eligible. The program is a nationwide pilot and will operate for the next 18 months.

Wind integration report

The Utility Wind Integration Group recently released a report summarizing five different studies on the effects of integrating wind power with utility grids. Utility Wind Integration State of the Art (123kB .pdf) found that while many issues do

exist with integrating wind onto the nation's transmission system, getting wind on the wires isn't as expensive as has been thought.

The report pointed out a series of positives for both wind power producers and for utilities looking at adding wind to their systems. First, costs do not increase all that dramatically as more wind is connected to the system. At penetrations of up to 20 percent of system peak demand, system operating costs rise "10 percent or less of the wholesale value of the wind energy."

Furthermore, the report found that these costs are likely to decrease in the future thanks to technology improvements in the field of wind forecasting.

The second finding is that adding wind to a system can actually improve its stability in response to a major plant outage. This is the result of combining proper plant engineering with new turbine designs and advancements in technologies that allow for taller towers.

N.M. jobs for solar technicians

Graduates from a small renewable-energy program at Farmington, N.M.'s San Juan College have jobs waiting for them as the state ramps up solar installations.

Public Service Company of New Mexico is building its first solar powerplant, while Federal and state

tax incentives stimulate investment in smaller systems. All those panels won't install themselves, so local solar vendors are looking for skilled technicians. Positive Energy, a Santa Fe company that is building the PMN plant, hired eight graduates from the college as temporary employees to work on the project.

The college's 2006-07 program filled within three days of being advertised. However, all 15 students enrolled for next year's renewable-energy program are from other states. Many graduates head for California, Washington and Oregon, states with generous incentives for solar and other renewable forms of energy. But the number of jobs available in New Mexico continues to grow.

San Juan College launched its renewable-energy program six years ago to meet an expected demand for technicians in the solar industry. Students who already have a bachelor's degree or a two-year associate degree can earn a one-year certificate in solar design and installation. Courses provide students with hands-on experience in electrical wiring according to the National Electrical Code standards. ⚡

Want to know more?

Visit www.wapa.gov/es/pubs/esb/2006/august/aug06es.html